Refine Search

Search Results -

Terms	Documents
L17 and simulat$	1

Database:

- US Pre-Grant Publication Full-Text Database
- US Patents Full-Text Database
- US OCR Full-Text Database
- EPO Abstracts Database
- JPO Abstracts Database
- Derwent World Patents Index
- IBM Technical Disclosure Bulletins

Search: L18

Refine Search

Recall Text   Clear   Interrupt

Search History

DATE: Thursday, August 25, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR		
L18	L17 and simulat$	1	L18
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR		
L17	6813610.pn. or 6823299.pn.	4	L17
	DB=USPT; THES=ASSIGNEE; PLUR=YES; OP=OR		
L16	6813610.pn. or 6323299.pn. or 5883638.pn.	3	L16
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR		
L15	L10 and l5	2	L15
L14	L10 and ((("3-d" adj simulat$) same object$ same comput$ and furniture) and animat$)	0	L14
L13	L10 and ((("3-d" adj simulat$) same object$ same comput$ same furniture) and animat$)	0	L13

L12	L10 and (((3d adj simulat$) same object$ same comput$ same furniture) and animat$)	0	L12
L11	L10 and l1	0	L11
L10	l9 or l7	129	L10
L9	(5845277 | 4631690 | 5696892 | 6195105 | 6307558 | 6111582 | 5537224 | 5261041 | 6137492 | 5522018 | 5363475 | 4615013 | 5563989 | 5317689 | 5630043 | 5550960 | 5990910 | 5333245 | 5684935 | 5561745 | 5561746 | 4645459 | 5577960 | 5778098 | 5222205 | 5596686 | 5615322 | 5581665)![PN]	55	L9
L8	('6765574'| 'GB 2337390A'| '6384834'| '6307558'| '20020138607'| '20030132973'| '5867166'| '20030088389')[PN]	14	L8
L7	('6765574'| 'GB 2337390A'| '6384834'| '6307558'| '20020138607'| '20030132973'| '5867166'| '20030088389')[URPN]	74	L7
L6	L5 not l1	7	L6
L5	((3d adj2 simulat$) same object$ same comput$) and animat$	8	L5
L4	(("3-d" adj simulat$) same object$ same comput$) and furniture and animat$	0	L4
L3	((3d adj simulat$) same object$ same comput$) and furniture and animat$	0	L3
L2	((3d adj simulat$) same object$ same comput$ same furniture) and animat$	0	L2
L1	(3d adj simulat$) same object$ same environment	7	L1

END OF SEARCH HISTORY

L18: Entry 1 of 1 File: USPT Nov 23, 2004

DOCUMENT-IDENTIFIER: US 6823299 B1
**** See image for Certificate of Correction ****
TITLE: Modeling objects, systems, and simulations by establishing relationships in an event-driven graph in a computer implemented graphics system

Abstract Text (1):
A computer-implemented graphics system defines an object-oriented framework for describing three-dimensional (3D) graphical objects, systems, and simulations. A 3D graphical image, a system, and a simulation are implemented as a directed multi-graph that includes a plurality of components defined by nodes connected by edges. A directed multi-graph engine in a graphics computer program processes the directed multi-graphs, wherein each node in the graph performs some specific function and the edges define relationships between the nodes. There are no restrictions on node types, and thus nodes may represent graphic objects (a visual representation), rules (rule-base behavior), attributes (data that does not affect the fundamental definition of the object), properties (data that affects the fundamental definition of the object), behaviors (methods), finite state machines (a sequence of actions and states), and any other user-defined component. There are no restrictions on edge types, and thus edges may represent event filters, connectivity, data, constraints, and any other user-defined relationship. Events traverse the graph, wherein the edges determine if and how traversal of the nodes is performed and any node may perform some sequence of operations in response to this traversal and the state of the graph.

Brief Summary Text (3):
The present invention relates generally to computer-implemented graphics systems, and in particular, to a method, apparatus, and article of manufacture for modeling objects, systems, and simulations by establishing relationships in an event-driven graph in a computer-implemented graphics system.

Brief Summary Text (7):
Moreover, most 3D graphics systems provide very simple interfaces to end-users and application developers. For example, they may provide a set of drawing commands that can be used to create visual representations of modeled 3D objects and simulations, but they rarely allow end-users or application developers to exploit any correlation between modeled objects and object-oriented programming techniques. While some object-oriented techniques are available, they do not go far enough. Consequently, there is a need in the art for 3D graphics systems that provide an improved object-oriented programming environment accessible to end-users and application developers.

Brief Summary Text (9):
To address the requirements described above, the present invention discloses a computer-implemented method, apparatus, and article of manufacture defining an object-oriented framework for describing three-dimensional (3D) graphical objects, systems, and simulations. An object, system, or simulation is implemented as a directed multi-graph that includes one or more nodes connected by zero or more edges. A directed multi-graph engine in a graphics computer program processes the

directed multi-graphs, wherein each node in the graph provides specific functionality as it defines a component of an object, system, or simulation, and the edges define the relationships between the nodes. There are no restrictions on node types, and thus nodes may represent graphic objects (a visual representation), rules (rule-base behavior), attributes (data that does not affect the fundamental definition of the object), properties (data that affects the fundamental definition of the object), behaviors (methods), finite state machines (a sequence of actions and states), and user-defined node types. There are no restrictions on edge types, and thus edges may represent event filters, connectivity graphic and logical), data, constraints, and user-defined edge types. Events traverse the graph, wherein edges determine if and how traversal of the nodes is performed, and any node may perform some sequence of operations in response to this traversal and the state of the graph.

Drawing Description Text (7):
FIGS. 5A and 5B are block diagrams that illustrate objects, systems, and simulations in a graph in the computer-implemented graphics program according to the preferred embodiment of the present invention;

Detailed Description Text (4):
The present invention defines an object-oriented framework for describing 3D graphical objects, systems, and simulations as directed multi-graphs, each of which includes one or more nodes connected by zero or more edges. A directed multi-graph engine processes the directed multi-graphs, wherein each node in the graph defines a component of an object, system, or simulation, and the edges define relationships between the nodes. Nodes provide specific functionality and thus may represent graphic object components (a visual representation), rule components (rule-base behavior), attribute components (data that does not affect the fundamental definition of the object), property components (data that affects the fundamental definition of the object), behavior components (methods), finite state machine components (a sequence of actions and states), and other user-defined components. Edges may represent event relationships, connectivity relationships (graphic and logical), data relationships, constraint relationships, and other user-defined relationships. Edges determine if and how events traverse the graph and the nodes may perform some sequence of operations in response to the traversal of the event and the state of the graph.

Detailed Description Text (20):
Each node 304 in a graph 300 defines a component designed to perform some specific function of an object, system, or simulation. There are no restrictions on node 304 types, and thus they may represent graphic objects (a visual representation), rules (rule-base behavior), attributes (data that does not affect the fundamental definition of the object), properties (data that affects the fundamental definition of the object), behaviors (methods), finite state machines (a sequence of actions and states), and user-defined types. A node 304 may inherit properties from its parent node 304.

Detailed Description Text (22):
Events traverse graphs 300 and any node 304 may change state and may perform some sequence of operations in response to the event and the current state of the node 304, the object being defined, the system, or the simulation. Essentially, events may trace zero or more edges 306 from node 304 to node 304. Events may be initiated externally (from an application/user) or internally (from any node 304).

Detailed Description Text (27):
The present invention defines an object-oriented framework for describing three-dimensional (3D) graphical objects, systems, and simulations where nodes 304 define components designed to perform specific functions of objects, systems, and simulations. Specifically, the present invention implements a directed multi-graph 300 framework to model objects, systems, and simulations in a graphics computer

program, where component nodes 304 are created, manipulated, and destroyed at runtime. Additionally node-to-node relationships in the graph 300 are also established at runtime as the graph 300 changes. One of the unique aspects of this model is that nodes 304 may represent graphic objects, behaviors, rules, properties, and attributes and other user-defined types. Nodes 304 can also define finite state machines, and the relationships between nodes 304 and their responses to events can be driven by state changes.

Detailed Description Text (29):
Further, each of the directed multi-graphs 300 may define one or more event-driven finite state machines. Thus, when the DMG Engine 204 interprets and/or executes directed multi-graphs 300, it interprets and/or executes event-driven finite state machines. Moreover, the directed multi-graphs 300 are recursive in that any node 304 can itself be a directed multi-graph 300 that may comprise a finite state machine. Finally, the relationships between nodes 304 in the directed multi-graphs 300, as well as the responses of the nodes 304 to events, can be driven by state changes of the nodes 304, state changes of the finite state machines, state changes of the systems, and state changes of the simulations.

Detailed Description Text (40):
In still another example, the present invention could be used to expand the geometric constraints of the graphical program into logical behavior. It includes a variety of authoring techniques that assign behaviors to 3D objects such as "close to", "on top of", "behind", "inside", "looks good with", etc. The product will have the most appeal in context of simulations, quick layouts, realistic human interactions, etc., and will therefore stimulate applications in (Internet) retailing, virtual product experiences, computer games, etc. This product would use the DMG Engine 204 to find appropriate real world relationships between real world objects, taking into account all of the graphical and non-graphical constraints of these relationships.

Detailed Description Text (48):
In summary, the present invention discloses a computer-implemented method, apparatus, and article of manufacture for defining an object-oriented framework for describing three-dimensional (3D) graphical objects, systems, and simulations. An object, system, or simulation is implemented as a directed multi-graph that includes one or more nodes connected by zero or more edges. A directed multi-graph engine in a graphics computer program processes the directed multi-graphs, wherein each node defines a component of an object, system, or simulation, and the edges define relationships between the nodes. There are no restrictions on node types, and thus nodes may represent graphic objects (a visual representation), rules (rule-base behavior), attributes (data that does not affect the fundamental definition of the object), properties (data that affects the fundamental definition of the object), behaviors (methods), and finite state machines (a sequence of actions and states). There are no restrictions on edge types, and thus edges may represent events, connectivity (graphic and logical), data, and constraints. Events traverse the graph, wherein the edges determine if and how traversal of the nodes is performed and any node may perform some sequence of operations in response to this traversal and the state of the graph.

CLAIMS:

1. A computer-implemented graphics system, comprising: (a) a computer having an output device coupled thereto; (b) a database for storing dynamic representations of a three-dimensional (3D) graphical image, system, or simulation as a graph, wherein the graph is comprised of at least one node and the nodes may be connected by zero or more edges; and (c) an Image Engine (IME) for processing the 3D graphical image, system, or simulation stored in the database and for delivering the processed 3D graphical image, system results, and simulation results to the output device, wherein the Image Engine includes a Directed Multi-Graph (DMG)

Engine for executing the graph stored in the database, each node in the graph defines a component designed to perform some specific function of the image, system, or simulation, the edges define relationships between the nodes, and events traverse the edges and the nodes of the graph, the edges determine whether and how the nodes are traversed, the nodes may perform at least one operation in response to the event traversal and a state of the graph, and the nodes are added to the graph and removed from the graph dynamically at runtime.

2. The system of claim 1, wherein the nodes define the components of the image, system, or simulation.

13. The system of claim 1, wherein the relationships between nodes may be driven by changes in the state of the nodes, the state of the image, the state of the system, or the state of the simulation.

14. A computer-implemented method of processing three-dimensional (3D) graphical images, systems, and simulations, comprising: (a) storing a dynamic representation of a three-dimensional (3D) graphical image, system, or simulation as a graph in a database, wherein the graph is comprised of at least one node and the nodes may be connected by zero or more edges; and (b) processing the 3D graphical age, system, or simulation stored in the database in an Image Engine (IME) and delivering the processed 3D graphical image, system results, and simulation results to an output device, wherein the Image Engine includes a Directed Multi-Graph (DMG) Engine for executing the graphs stored in the database, each node in the graph defines a component designed to perform some specific function of the image, system, or simulation, the edges define relationships between the nodes, and events traverse the edges and the nodes of the graph, the edges determine whether and how the nodes are traversed, the nodes may perform at least one operation in response to the event traversal and a state of the graph, and the nodes are added to the graph and removed from the graph dynamically at runtime.

15. The method of claim 14, wherein the nodes define the components of the image, system, or simulation.

26. The method of claim 14, wherein the relationships between nodes may be driven by changes in the state of the nodes, the state of the image, the state of the system, or the state of the simulation.

27. An article of manufacture embodying logic for performing a computer-implemented method of processing three-dimensional (3D) graphical images, systems, and simulations, the method comprising: (a) storing a dynamic representation of a three-dimensional (3D) graphical image, system, or simulation as a graph in a database, wherein the graph is comprised of at least one node and the nodes may be connected by zero or more edges; and (b) processing the 3D graphical image, system, or simulation stored in the database in an Image Engine (IME) and delivering the processed 3D graphical image, system results, or simulation results to an output device, wherein the Image Engine includes a Directed Multi-Graph (DMG) Engine for executing the graphs stored in the database, each node in the graph defines a component designed to perform some specific function of the image, system, or simulation, the edges define relationships between the nodes, and events traverse the edges and the nodes of the graph, the edges determine whether and how the nodes are traversed, the nodes may perform at least one operation in response to the event traversal and a state of the graph, and the nodes are added to the graph and removed from the graph dynamically at runtime.

28. The method of claim 27, wherein the nodes define the components of he image, system, or simulation.

39. The method of claim 27, wherein the relationships between nodes may be driven by changes in the state of the nodes, the state of the image, the state of the

system, or the state of the simulation.

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L2: Entry 1 of 1 File: USPT Oct 23, 2001

US-PAT-NO: 6307558
DOCUMENT-IDENTIFIER: US 6307558 B1
**** See image for Certificate of Correction ****

TITLE: Method of hierarchical static scene simplification

DATE-ISSUED: October 23, 2001

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mao; Crusoe	Shanghai			CN

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Intel Corporation	Santa Clara	CA			02

APPL-NO: 09/ 262171 [PALM]
DATE FILED: March 3, 1999

INT-CL: [07] G06 T 17/00

US-CL-ISSUED: 345/428; 345/423
US-CL-CURRENT: 345/428; 345/423

FIELD-OF-SEARCH: 345/419, 345/420, 345/421, 345/423, 345/428

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
5317689	May 1994	Nack et al.	395/163
5990910	November 1999	Laksono et al.	345/503
6111582	August 2000	Jenkins	345/421
6137492	October 2000	Hoppe	345/420
6195105	February 2001	Dilliplane et al.	345/506

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Foley et al. "Computer Graphics; Principles and Practice" second edition ISBN 0-201-12110-7, reprinted 11/192 and 193, pp. 873-882, Nov. 1992.*
Bishop et al., "Designing a PC Game Engine," IEEE Computer Graphics and Application, Jan./Feb. 1998, pp. 46-53.
Hoppe et al., "Surface Reconstruction from Unorganized Points," University of Washington White Paper, 8 pages.
Belblidia et al., "Generating Various Levels of Detail of Architectural Objects for Image-Quality and Frame-Rate Control Rendering," White Paper, 6 pages.
Cohen et al., "Simplification Envelopes," Computer Graphics (SIGGRAPH '95 Proceedings) (1996), 10 pages.
Hoppe, Hugues, "Progressive Meshes," Microsoft Research White Paper, 10 pages.
Hoppe et al., "Mesh Optimization," Computer Graphics (SIGGRAPH '93 Proceedings) (1993), 8 pages.
Luebke, David, "Hierarchical Structures For Dynamic Polygonal Simplification," TR 96-006, Department of Computer Science, University of North Carolina at Chapel Hill, 7 pages.
Krus et al., "Levels of Detail & Polygonal Simplification," Crossroads, The ACM's First Electronic Publication, 15 pages.
Hoppe, Hugues, Efficient Implementation of Progressive Meshes, Technical Report MSR-TR-98-02, Microsoft Research, Jan. 1998, 10 pages.

ART-UNIT: 261

PRIMARY-EXAMINER: Zimmerman; Mark

ASSISTANT-EXAMINER: Santiago; Enrique L

ATTY-AGENT-FIRM: Skabrat; Steven P.

ABSTRACT:

A method of scene simplification includes concurrently simplifying a plurality of objects in a scene represented by a hierarchical scene graph. The objects are represented as polygonal meshes and the hierarchical scene graph includes a plurality of nodes, each node storing a mesh. The scene is a three dimensional scene and the objects are representations of three dimensional objects. Concurrently simplifying the plurality of objects includes determining an initial least level of detail polygon reduction ratio (LPPR) for at least one mesh, generating levels of detail variables for at least one mesh using the LPRR, and generating a simplified version of at least one mesh by using the levels of detail variables.

14 Claims, 7 Drawing figures

Previous Doc Next Doc Go to Doc#

L2: Entry 1 of 1 File: USPT Oct 23, 2001

DOCUMENT-IDENTIFIER: US 6307558 B1
**** See image for Certificate of Correction ****
TITLE: Method of hierarchical static scene simplification

Brief Summary Text (5):
Computer-generated visual simulations are used in many application areas, such as flight simulation, building walkthroughs, computational fluid dynamics, and video games, for example, with the purposes of training, evaluation, education, and entertainment. Since recent general purpose graphics workstations and personal computers (PCs) allow the interactive display of thousands of polygons making up representations of three dimensional (3D) objects, these simulations have become more common and accessible to a variety of users, such as scientists, educators, and game players. However, as graphics performance increases and its cost decreases, a new generation of users will demand even more complex and more realistic animations. Such animations will require real-time performance at approximately constant frame rates so that the user has the feeling of actual immersion in a virtual world.

Brief Summary Text (6):
In response, content authors are creating more complicated simulations. A simulation may include many different scenes, each with many objects. An object is typically represented as a polygonal mesh. A complicated object may be represented by a mesh containing hundreds or thousands of polygons. When more polygons are present in the mesh, the quality of the image shown on the display is better (that is, it is more detailed), but the time required to display the object is higher. When less polygons are present in the mesh, the quality of the image is poorer, but the time required to display the object is lower. In some cases, a graphics subsystem cannot render a scene having many complicated objects in real-time. A graphics subsystem may attempt to simplify some or all of the objects so that the scene can be displayed more quickly. For example, if an object is initially represented by a mesh having 10,000 polygons, it may be simplified by methods known in the art to a representation of the object having only 1,000 polygons. The object may be simplified further, for example, into a representation having only 100 polygons. These different representations are called levels of detail (LOD). Such LODs are commonly represented in a multi-resolution mesh (MRM). Depending on the desired image quality and system bandwidth, different instances of a multi-resolution mesh representing an object may be used.

Detailed Description Text (4):
An embodiment of the present invention operates within a 3D graphics application, which creates and manages a scene graph stored in a graphical database. A scene graph is a data structure used to store a scene. A scene graph is typically structured as a tree, or more specifically, a directed acyclic graph (DAG). Nodes of the tree represent individual models of 3D objects present in a scene. The scene graph may comprise multiple complex, highly detailed polygonal surfaces or meshes arranged in a hierarchical manner. FIG. 1 is a diagram of a sample scene graph having three meshes according to an embodiment of the present invention. In this example, scene graph 10 comprises three polygonal meshes: M012, M114, and M216,

arranged in a hierarchy as shown. Although this example shows three meshes being part of the scene graph, one skilled in the art will understand that a scene graph may comprise any number of meshes in any number of levels of a hierarchy, and the present invention is not limited in scope in this respect.

Detailed Description Text (60):
According to an embodiment of the present invention, a triangular surface simplification method may be described as follows. It may be based on edge contraction, but it only supports manifold models. In terms of efficiency, the method may be used to simplify complex models quite rapidly. For example, it can create a 900 faces approximation of a 18,000 faces model in approximately 15 seconds on a personal computer system having dual Pentium.RTM.II Xeon processors (commercially available from Intel Corporation) operating at 400 MHZ, with a 1M internal cache, and 128 MB of memory. The method provides high quality approximations. The approximations produced by this technique maintain high fidelity to the original model. The sharp and primary features of the model, including the scalar attributes of texture coordinates/vertex color are preserved. In addition, the technique permits changes to the topology of discrete attributes, for example, the Material ID (texture).

Detailed Description Text (61):
The technique may support terrain-like models (e.g., height fields), by adding an additional perpendicular plane running through a contracted edge, which in one embodiment may be weighted by a large penalty factor and subsequently added to the energy equation. The technique maintains a heap (a spatial partitioning data structure) which stores all valid edge contraction pairs indexed by their respective .O slashed.E values. In addition, the technique uses a local optimization; each edge contraction action corresponds only to a local incremental modification of the current model. In fact, the technique generates a sequence of models M.sub.n, M.sub.n-1, . . . M.sub.i. Thus, a single pass may be used to produce a large number of approximate models or a multiresolution representation such as a progressive mesh (as discussed in Hugues Hoppe, "Progressive Meshes", SIGGRAPH'96 Proceedings, pages 99-108, August 1996.).

Previous Doc Next Doc Go to Doc#

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L6: Entry 7 of 7 File: DWPI Nov 17, 1999

DERWENT-ACC-NO: 2000-001700
DERWENT-WEEK: 200003

TITLE: Digital processing method of correlating 2D images to form a 3D reconstruction for e.g. graphics/animation

Basic Abstract Text (2):
DETAILED DESCRIPTION - The overlapping 2D images from a camera is moved relative to an object between the different viewpoints (1,1'), the net movement of the camera between the viewpoints not being fully constrained. The respective orientations of the camera at different viewpoints relative to a reference frame which is fixed with respect to the object, differs by less than 10 degrees. The overlapping 2D images are projected from their nominal viewpoints such that the projections intersect to form an initial 3D reconstruction in simulated 3D space. The line (ST) joining the camera positions is derived and a partial 3D reconstruction is derived by aligned virtual projectors (PR1,PR2/PR2') located an arbitrary distance apart. The rotated and translated initial 3D reconstruction features, are generated from the intersecting projections of correlated features of the projected images to lie on the projections of those features from one of the 2D images, thereby forming a further reconstruction. The angle subtended by a pair of correlated features at the corresponding feature of the object is 90 degrees plus or minus 10 degrees, and the manipulation of the 3D reconstruction's are performed under the control of a computer pointing device operated by the user. Also the camera may be hand-held and carry a 3-axis vibratory gyroscope (G) with associated filtering (Kalman filter preferred) circuitry and integrating circuitry to generate and display on screen 3-axis orientation signals. INDEPENDENT CLAIMS are also included for the following:

Basic Abstract Text (8):
USE - For deriving a 3D representation from two or more 2D images for e.g. fields of design, graphics and animation.

Standard Title Terms (1):
DIGITAL PROCESS METHOD CORRELATE IMAGE FORM RECONSTRUCT GRAPHIC ANIMATED

L15: Entry 1 of 2 File: USPT Jul 20, 2004

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DOCUMENT-IDENTIFIER: US 6765574 B1
**** See image for Certificate of Correction ****
TITLE: Methods of hierarchical static scene simplification and polygon budgeting for 3D models

Brief Summary Text (4):
Computer-generated visual simulations are used in many application areas, such as flight simulation, building walkthroughs, computational fluid dynamics, and video games, for example, with the purposes of training, evaluation, education, and entertainment. Since recent general purpose graphics workstations and personal computers (PCs) allow the interactive display of thousands of polygons making up representations of three dimensional (3D) objects, these simulations have become more common and accessible to a variety of users, such as scientists, educators, and game players. However, as graphics performance increases and its cost decreases, a new generation of users will demand even more complex and more realistic animations. Such animations will require real-time performance at approximately constant frame rates so that the user has the feeling of actual immersion in a virtual world.

US Reference Patent Number (2):
6307558

L6: Entry 7 of 7 File: DWPI Nov 17, 1999

DERWENT-ACC-NO: 2000-001700
DERWENT-WEEK: 200003

TITLE: Digital processing method of correlating 2D images to form a 3D reconstruction for e.g. graphics/animation

INVENTOR: MEIR, I; WILSON, J

PATENT-ASSIGNEE: TRICORDER TECHNOLOGY PLC (TRICN)

PRIORITY-DATA: 1998GB-0010553 (May 15, 1998)

Search Selected Search ALL Clear

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
GB 2337390 A	November 17, 1999		040	H04N013/00

APPLICATION-DATA:

PUB-NO	APPL-DATE	APPL-NO	DESCRIPTOR
GB 2337390A	June 8, 1998	1998GB-0012200	

INT-CL (IPC): H04 N 13/00

RELATED-ACC-NO: 2000-039459

ABSTRACTED-PUB-NO: GB 2337390A
BASIC-ABSTRACT:

NOVELTY - The method involves digitally processing 2D images to form a 3D reconstruction in which a common feature of the object (3) is located in a simulated 3D space in dependence upon both a mutual offset and a scaling variable. The reconstruction (30) in the simulated 3D space is displayed on screen and the scaling variable is entered by the user.

DETAILED DESCRIPTION - The overlapping 2D images from a camera is moved relative to an object between the different viewpoints (1,1'), the net movement of the camera between the viewpoints not being fully constrained. The respective orientations of the camera at different viewpoints relative to a reference frame which is fixed with respect to the object, differs by less than 10 degrees. The overlapping 2D images are projected from their nominal viewpoints such that the projections intersect to form an initial 3D reconstruction in simulated 3D space. The line (ST) joining the camera positions is derived and a partial 3D reconstruction is derived by aligned virtual projectors (PR1,PR2/PR2') located an arbitrary distance apart.

The rotated and translated initial 3D reconstruction features, are generated from the intersecting projections of correlated features of the projected images to lie on the projections of those features from one of the 2D images, thereby forming a further reconstruction. The angle subtended by a pair of correlated features at the corresponding feature of the object is 90 degrees plus or minus 10 degrees, and the manipulation of the 3D reconstruction's are performed under the control of a computer pointing device operated by the user. Also the camera may be hand-held and carry a 3-axis vibratory gyroscope (G) with associated filtering (Kalman filter preferred) circuitry and integrating circuitry to generate and display on screen 3-axis orientation signals. INDEPENDENT CLAIMS are also included for the following:

(1) an image processing apparatus

(2) a method of determining the motion of a camera

(3) an apparatus for determining the motion of a camera

(4) a method of generating a 3D reconstruction of an object and

(5) an apparatus for generating a 3D reconstruction of an object.

USE - For deriving a 3D representation from two or more 2D images for e.g. fields of design, graphics and animation.

ADVANTAGE - A scaled representation can be generated by any pair of virtual projectors on line ST, once the direction of the line ST is known. The procedure can be carried out either manually by the user with the aid of a suitable display of the images and ray lines on the screen or automatically with software.

DESCRIPTION OF DRAWING(S) - The drawings show ray diagrams illustrating the relationship between the object, camera viewpoints, projector viewpoints and a partial 3D reconstruction; and a derivation of the direction of movement of the camera from the acquired images, respectively.

Viewpoints 1,1'

Object 3

Reconstruction 30

Aligned virtual projectors PR1,PR2,PR2'

Line ST

ABSTRACTED-PUB-NO: GB 2337390A
EQUIVALENT-ABSTRACTS:

CHOSEN-DRAWING: Dwg.2,3/3

DERWENT-CLASS: T01 W02
EPI-CODES: T01-J04B2; T01-J10C4; T01-J10C5; T01-J10C7; T01-S02; W02-F03B;

Previous Doc Next Doc Go to Doc#

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L6: Entry 4 of 7 File: USPT May 7, 2002

US-PAT-NO: 6384834
DOCUMENT-IDENTIFIER: US 6384834 B1

TITLE: Three-dimensional simulator apparatus and image synthesis method using texture computation and texture information storage

DATE-ISSUED: May 7, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Watanabe; Hiroyuki	Yokohama			JP

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Namco Ltd.	Tokyo			JP	03

APPL-NO: 08/ 632463 [PALM]
DATE FILED: April 22, 1996

FOREIGN-APPL-PRIORITY-DATA:

COUNTRY	APPL-NO	APPL-DATE
JP	6-219418	August 22, 1994

PCT-DATA:

APPL-NO	DATE-FILED	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
PCT/JP95/01628	August 16, 1995	WO96/06410	Feb 29, 1996	Apr 22, 1996	Apr 22, 1996

INT-CL: [07] G06 T 11/40

US-CL-ISSUED: 345/582; 345/581, 382/285
US-CL-CURRENT: 345/582; 345/581, 382/285

FIELD-OF-SEARCH: 395/129, 395/130, 345/429, 345/430, 345/425, 345/581, 345/582, 463/31, 463/40, 434/62-70, 382/285

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	4615013	September 1986	Yan et al.	345/430

☐	5222205	June 1993	Larson et al.	345/430
☐	5261041	November 1993	Susman	345/430 X
☐	5333245	July 1994	Vecchione	345/430
☐	5537224	July 1996	Suzuoki et al.	345/340
☐	5550960	August 1996	Shriman et al.	345/340
☐	5561745	October 1996	Jackson et al.	345/419
☐	5561746	October 1996	Murata et al.	345/419
☐	5577960	November 1996	Sasaki	463/32
☐	5615322	March 1997	Murata et al.	
☐	5630043	May 1997	Uhlin	345/474
☐	5696892	December 1997	Redmann et al.	345/425

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
1-131976	May 1989	JP	
1-131976	May 1989	JP	
6-103385	April 1994	JP	
06-223199	December 1994	JP	

OTHER PUBLICATIONS

"Visualization for Climate Modeling": Nelson Max et al; IEEE Computer Graphics & Application, 0272-17-16/93/0700-/0034.*
Korein et al., "Temporal Anti-Aliasing in Computer Generated Animation," Computer Graphics, vol. 17, No. 3, pp. 377-388, 1983.*
Pixel, Oct. 1993; p. 41, picture 4.

ART-UNIT: 2671

PRIMARY-EXAMINER: Zimmerman; Mark

ASSISTANT-EXAMINER: Padmanabhan; Mano

ATTY-AGENT-FIRM: Oliff & Berridge, PLC

ABSTRACT:

The present invention provides a three-dimensional simulator apparatus and image synthesis method which may realistically simulate the real world when the velocity and/or rotational velocity of a display object has changed or when the surface state of that display object is to change in accordance with simulation circumstances. An image synthesis section (200) contains a texture computation section (230) for performing computations to map textures onto the display objects and a texture information storage section (242) for storing information of the textures to be mapped. Different types of texture information is stored in the texture information storage section (242) for the same display object. Either the type of information of the texture to be mapped onto the display object or information specifying that type is changed in accordance to the velocity and/or

rotational velocity of the display object, or with the surface state of the display object which surface state changes with simulation circumstances. This enables an increase in realism of the simulation.

20 Claims, 25 Drawing figures

Previous Doc Next Doc Go to Doc#

7

L6: Entry 4 of 7 File: USPT May 7, 2002

DOCUMENT-IDENTIFIER: US 6384834 B1
TITLE: Three-dimensional simulator apparatus and image synthesis method using texture computation and texture information storage

Brief Summary Text (4):
Various types of three-dimensional (3D) simulator apparatus that are used in applications such as 3D games and piloting simulators for aircraft or other vehicles are known in the art. With such a 3D simulator apparatus, image information relating to a 3D object 300 shown in FIG. 20A is previously stored within the apparatus. This 3D object 300 depicts an element such as scenery that can be seen by a player (observer) 302 as if through a screen 306. This display object is displayed as a pseudo-3D image (projected image) 308 on the screen 306, by perspective projection conversion on the screen 306 of the image information of the 3D object 300. When the player 302 specifies an operation such as rotation or forward motion through a control panel 304, this apparatus performs predetermined 3D computation processing on the basis of the resultant operating signals. More specifically, computations are first performed to determine whether a change has occurred, such as a change in the viewpoint and where the eyes of the player 302 are directed or a change in the position and orientation of a vehicle in which the player 302 is sitting, as specified by these operating signals. Computations are then performed to determine how the image of the 3D object 300 can be seen on the screen 306, in accordance with this change such as a change in viewpoint and where the player's eyes are directed. The above computations are performed in real time, following the actions of the player 302. This makes it possible for the player 302 to see any change in the scenery, due to a change in the player's own viewpoint or where the player's eyes are directed or a change in the position or orientation of the vehicle in which the player is sitting, as a pseudo-3D image in real time, to simulate the experience of a virtual 3D space.

Detailed Description Text (18):
In this embodiment, the image synthesis section 200 comprises a texture computation section 230 and a texture information storage section 242. In this case, the texture computation section 230 performs computations for mapping a texture onto a display object. The texture information storage section 242 stores texture information for the mapping done by the texture computation section 230. This texture information represents patterns such as the patterns of lettering and wheels to be mapped onto the side surface of a tire, or that of a tread surface to be mapped onto the running surface of the tire. A plurality of types of texture information are stored in the texture information storage section 242 for the same display object, such as a tire. More specifically, texture information representing lettering and a wheel (spoke) pattern for a halted state, texture information representing lettering and a wheel pattern that are slightly blurred by the rotation of the tire, and texture information representing lettering and a wheel pattern that are completely blurred so that they flow in the direction of rotation of the tire are stored as textures to be mapped onto the side surface of the tire. Similarly, texture information representing a totally black tread surface, texture information representing a tread surface that has gravel adhering to it and is speckled with white, and texture information representing an even whiter tread surface are stored as textures to be mapped onto the running surface of the tire. The 3D simulator apparatus of this embodiment also comprises means for modifying

the type of texture information, such as that to be mapped onto the side surface of the tire, in a manner consistent with a factor such as the rotational velocity of the tire or the running speed of the racing car. Similarly, the apparatus also comprises means for modifying the type of information of the texture to be mapped onto the running surface of the tire in a manner consistent with the surface-state of the tire that changes with the circumstances of the simulation (game circumstances). In other words, if the circumstances of the simulation become such that the racing car leaves the course and enters a gravel road area and thus the state of the running surface of a tire that is a display object is to change to become speckled with white, for example, texture information representing a whitish surface is used for mapping onto the running surface of the tire. Note that these modification means may be formed within either a virtual 3D space computation section 100 or the image synthesis section 200, or within both.

Other Reference Publication (2):
Korein et al., "Temporal Anti-Aliasing in Computer Generated Animation," Computer Graphics, vol. 17, No. 3, pp. 377-388, 1983.*

Previous Doc Next Doc Go to Doc#

Hit List

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Search Results - Record(s) 1 through 7 of 7 returned.

☐ 1. Document ID: US 20030088389 A1

Using default format because multiple data bases are involved.

A

L6: Entry 1 of 7 File: PGPB May 8, 2003

PGPUB-DOCUMENT-NUMBER: 20030088389
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030088389 A1

TITLE: Long elements method for simulation of deformable objects

PUBLICATION-DATE: May 8, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Balaniuk, Remis	Sunnyvale	CA	US	
Costa, Ivan F.	Brasilia	CA	BR	
Salisbury, J. Kenneth JR.	Mountain View		US	

US-CL-CURRENT: 703/2

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

☐ 2. Document ID: US 20020138607 A1

A

L6: Entry 2 of 7 File: PGPB Sep 26, 2002

PGPUB-DOCUMENT-NUMBER: 20020138607
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20020138607 A1

TITLE: System, method and computer program product for data mining in a three-dimensional multi-user environment

PUBLICATION-DATE: September 26, 2002

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
O' Rourke, Kristen P.	Menlo Park	CA	US	
Banks, Douglas S.	Menlo Park	CA	US	
McHugh, Jason G.	Menlo Park	CA	US	

US-CL-CURRENT: 709/224; 709/218

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 3. Document ID: US 6765574 B1

L6: Entry 3 of 7 File: USPT Jul 20, 2004

Y

US-PAT-NO: 6765574
DOCUMENT-IDENTIFIER: US 6765574 B1
**** See image for Certificate of Correction ****

TITLE: Methods of hierarchical static scene simplification and polygon budgeting for 3D models

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 4. Document ID: US 6384834 B1

L6: Entry 4 of 7 File: USPT May 7, 2002

US-PAT-NO: 6384834
DOCUMENT-IDENTIFIER: US 6384834 B1

TITLE: Three-dimensional simulator apparatus and image synthesis method using texture computation and texture information storage

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 5. Document ID: US 6307558 B1

L6: Entry 5 of 7 File: USPT Oct 23, 2001

Y

US-PAT-NO: 6307558
DOCUMENT-IDENTIFIER: US 6307558 B1
**** See image for Certificate of Correction ****

TITLE: Method of hierarchical static scene simplification

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 6. Document ID: US 5867166 A

L6: Entry 6 of 7 File: USPT Feb 2, 1999

US-PAT-NO: 5867166
DOCUMENT-IDENTIFIER: US 5867166 A
**** See image for Certificate of Correction ****

TITLE: Method and system for generating images using Gsprites

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

7. Document ID: GB 2337390 A

L6: Entry 7 of 7 File: DWPI Nov 17, 1999

DERWENT-ACC-NO: 2000-001700
DERWENT-WEEK: 200003

TITLE: Digital processing method of correlating 2D images to form a 3D reconstruction for e.g. graphics/animation

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

Clear | Generate Collection | Print | Fwd Refs | Bkwd Refs | Generate OACS

Terms	Documents
L5 not L1	7

Display Format: - Change Format

Previous Page Next Page Go to Doc#

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Generate Collection Print

7

L6: Entry 3 of 7 File: USPT Jul 20, 2004

US-PAT-NO: 6765574
DOCUMENT-IDENTIFIER: US 6765574 B1
**** See image for Certificate of Correction ****

TITLE: Methods of hierarchical static scene simplification and polygon budgeting for 3D models

DATE-ISSUED: July 20, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY
Mao; Xiaodong	Foster City	CA		
Guo; Baining	Bellevue	WA		

ASSIGNEE-INFORMATION:

NAME	CITY	STATE	ZIP CODE	COUNTRY	TYPE CODE
Intel Corporation	Santa Clara	CA			02

APPL-NO: 09/ 979630 [PALM]
DATE FILED: March 18, 2002

PCT-DATA:

APPL-NO	DATE-FILED	PUB-NO	PUB-DATE	371-DATE	102(E)-DATE
PCT/CN99/00218	December 23, 1999	WO01/48697	Jul 5, 2001		

INT-CL: [07] G06 T 17/00

US-CL-ISSUED: 345/428; 345/423
US-CL-CURRENT: 345/428; 345/423

FIELD-OF-SEARCH: 345/428, 345/423

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

Search Selected Search ALL Clear

	PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
☐	5845277	December 1998	Pfeil et al.	
☐	6307558	October 2001	Mao	345/428

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	US-CL
0 549 944	July 1993	EP	
0 784 295	July 1997	EP	
WO 97/34253	September 1997	WO	

ART-UNIT: 2671

PRIMARY-EXAMINER: Zimmerman; Mark

ASSISTANT-EXAMINER: Arnold; Adam

ATTY-AGENT-FIRM: Skabrat; Steven P.

ABSTRACT:

A method of scene simplification includes concurrently simplifying a plurality of objects in a scene represented by a hierarchical scene graph. The objects are represented as polygonal meshes and the hierachical scene graph includes a plurality of nodes, each node storing a mesh. The scene is a three dimensional scene and the objects are representations of three dimensional objects. Concurrently simplifying the plurality of objects includes determining an initial least level of detail polygon reduction ratio (LPPR) for at least one mesh, generating levels of detail variables for at least one mesh using the LPRR, and generating a simplified version of at least one mesh by using the levels of detail variables. The total number of polygons in a rendered scene may be set to correspond to a predetermined polygon budget.

4 Claims, 10 Drawing figures

Previous Doc Next Doc Go to Doc#

L6: Entry 3 of 7 File: USPT Jul 20, 2004

DOCUMENT-IDENTIFIER: US 6765574 B1

**** See image for Certificate of Correction ****

TITLE: Methods of hierarchical static scene simplification and polygon budgeting for 3D models

Brief Summary Text (4):

Computer-generated visual simulations are used in many application areas, such as flight simulation, building walkthroughs, computational fluid dynamics, and video games, for example, with the purposes of training, evaluation, education, and entertainment. Since recent general purpose graphics workstations and personal computers (PCs) allow the interactive display of thousands of polygons making up representations of three dimensional (3D) objects, these simulations have become more common and accessible to a variety of users, such as scientists, educators, and game players. However, as graphics performance increases and its cost decreases, a new generation of users will demand even more complex and more realistic animations. Such animations will require real-time performance at approximately constant frame rates so that the user has the feeling of actual immersion in a virtual world.

L1: Entry 5 of 7 File: PGPB Sep 11, 2003

DOCUMENT-IDENTIFIER: US 20030171190 A1
TITLE: Games controllers

Summary of Invention Paragraph:
[0473] Measure/Process the inputs,in accordance with the software, "looking" for specific inputs, repeated inputs, combinations of inputs together or in sequences, etc and determines user's simulated position, velocities, accelerations, spins, forces, etc in accordance with all input signals and a virtual simulation engine and a 3D simulated world consisting of virtual roads, objects, events, worlds, etc., i.e. an environment of competitors, obstacles and opportunities for advancement/relegation in a gaming metaphor. The software uses 3D graphics, sound and trade secret movement sensor alogarithms and engines where not just the user's physical activity provides advantages but the user's technical skills with the steering/weight/lift/controls and brakes and seat also.

Hit List

Your wildcard search against 10000 terms has yielded the results below.

Your result set for the last L# is incomplete.

The probable cause is use of unlimited truncation. Revise your search strategy to use limited truncation.

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Search Results - Record(s) 1 through 7 of 7 returned.

A ☐ 1. Document ID: US 20050171754 A1

Using default format because multiple data bases are involved.

L1: Entry 1 of 7 File: PGPB Aug 4, 2005

PGPUB-DOCUMENT-NUMBER: 20050171754
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050171754 A1

TITLE: Automatic scenery object generation

PUBLICATION-DATE: August 4, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Santodomingo, Victor	Redmond	WA	US	
Dent, Jason M.	Seattle	WA	US	
Waskey, Jason L.	Seattle	WA	US	

US-CL-CURRENT: 703/21

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

A ☐ 2. Document ID: US 20050156928 A1

L1: Entry 2 of 7 File: PGPB Jul 21, 2005

PGPUB-DOCUMENT-NUMBER: 20050156928
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20050156928 A1

TITLE: Efficient scenery object rendering

PUBLICATION-DATE: July 21, 2005

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Santodomingo, Victor	Redmond	WA	US	

Waskey, Jason L.	Seattle	WA	US
Dent, Jason M.	Seattle	WA	US

US-CL-CURRENT: 345/428; 702/5

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 3. Document ID: US 20040263512 A1

L1: Entry 3 of 7 File: PGPB Dec 30, 2004

PGPUB-DOCUMENT-NUMBER: 20040263512
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040263512 A1

TITLE: Efficient scenery object rendering

PUBLICATION-DATE: December 30, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Santodomingo, Victor E.	Kirkland	WA	US	
Waskey, Jason L.	Seattle	WA	US	
Dent, Jason M.	Seattle	WA	US	

US-CL-CURRENT: 345/428

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw De

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☐ 4. Document ID: US 20040136538 A1

A

L1: Entry 4 of 7 File: PGPB Jul 15, 2004

PGPUB-DOCUMENT-NUMBER: 20040136538
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20040136538 A1

TITLE: Method and system for simulating a 3d sound environment

PUBLICATION-DATE: July 15, 2004

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Cohen, Yuval	Migdal Haemek		IL	
Bar On, Amir	Rehovot		IL	
Naveh, Giora	Rehovot		IL	
Levy, Haim	Ra'anana		IL	

US-CL-CURRENT: 381/17; 381/1, 381/309

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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Y ✓ ☐ 5. Document ID: US 20030171190 A1

L1: Entry 5 of 7 File: PGPB Sep 11, 2003

PGPUB-DOCUMENT-NUMBER: 20030171190
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030171190 A1

TITLE: Games controllers

PUBLICATION-DATE: September 11, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Rice, Michael Joseph Patrick	Bath		GB	

US-CL-CURRENT: 482/57; 482/908

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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A ☐ 6. Document ID: US 20030132973 A1

L1: Entry 6 of 7 File: PGPB Jul 17, 2003

PGPUB-DOCUMENT-NUMBER: 20030132973
PGPUB-FILING-TYPE: new
DOCUMENT-IDENTIFIER: US 20030132973 A1

TITLE: System, method and computer program product for intuitive interactive navigation control in virtual environments

PUBLICATION-DATE: July 17, 2003

INVENTOR-INFORMATION:

NAME	CITY	STATE	COUNTRY	RULE-47
Hughes, David W.	Oxon		GB	

US-CL-CURRENT: 715/850

Full	Title	Citation	Front	Review	Classification	Date	Reference	Sequences	Attachments	Claims	KWIC	Draw De

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☐ 7. Document ID: US 6446055 B1

L1: Entry 7 of 7 File: USPT Sep 3, 2002

US-PAT-NO: 6446055
DOCUMENT-IDENTIFIER: US 6446055 B1

TITLE: Process control

Full | Title | Citation | Front | Review | Classification | Date | Reference | Sequences | Attachments | Claims | KWIC | Draw. De

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Terms	Documents
(3d adj simulat$) same object$ same environment	7

Display Format: - Change Format

Previous Page Next Page Go to Doc#

Refine Search

Search Results -

Terms	Documents
L10 and L5	2

Database:
US Pre-Grant Publication Full-Text Database
US Patents Full-Text Database
US OCR Full-Text Database
EPO Abstracts Database
JPO Abstracts Database
Derwent World Patents Index
IBM Technical Disclosure Bulletins

Search: L15

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Recall Text Clear Interrupt

Search History

DATE: Thursday, August 25, 2005 Printable Copy Create Case

Set Name side by side	Query	Hit Count	Set Name result set
	DB=PGPB,USPT,USOC,EPAB,JPAB,DWPI,TDBD; THES=ASSIGNEE; PLUR=YES; OP=OR		
L15	L10 and l5	2	L15
L14	L10 and ((("3-d" adj simulat$) same object$ same comput$ and furniture) and animat$)	0	L14
L13	L10 and ((("3-d" adj simulat$) same object$ same comput$ same furniture) and animat$)	0	L13
L12	L10 and (((3d adj simulat$) same object$ same comput$ same furniture) and animat$)	0	L12
L11	L10 and l1	0	L11
L10	l9 or l7	129	L10
L9	(5845277 | 4631690 | 5696892 | 6195105 | 6307558 | 6111582 | 5537224 | 5261041 | 6137492 | 5522018 | 5363475 | 4615013 | 5563989 | 5317689 | 5630043 | 5550960 | 5990910 | 5333245 | 5684935 | 5561745 | 5561746 | 4645459 | 5577960 | 5778098 | 5222205 | 5596686 | 5615322 | 5581665)![PN]	55	L9

L8	('6765574'| 'GB 2337390A'| '6384834'| '6307558'| '20020138607'| '20030132973'| '5867166'| '20030088389')[PN]	14	L8
L7	('6765574'| 'GB 2337390A'| '6384834'| '6307558'| '20020138607'| '20030132973'| '5867166'| '20030088389')[URPN]	74	L7
L6	L5 not l1	7	L6
L5	((3d adj2 simulat$) same object$ same comput$) and animat$	8	L5
L4	(("3-d" adj simulat$) same object$ same comput$) and furniture and animat$	0	L4
L3	((3d adj simulat$) same object$ same comput$) and furniture and animat$	0	L3
L2	((3d adj simulat$) same object$ same comput$ same furniture) and animat$	0	L2
L1	(3d adj simulat$) same object$ same environment	7	L1

END OF SEARCH HISTORY